❖ G-4 NEWS ❖

Volume 2 Issue 1 ***The** Newsletter for Oxygen Compatibility Practitioners* Spring 1995

Benz Grades G-4's "Score"

One score of years ago [that's twenty], ASTM Committee G-4 began operations. At G-4's seventh symposium, KeyNote Speaker Frank Benz, the ebullient former Chief of NASA's White Sands Test Facility Oxygen Testing Laboratory, now of Johnson Space Center, gave G-4 a report card, grading this score of years—He gave G-4 an overall "B+."

Past keynotes have often dissected the Committee but none with such surgical finesse. Benz graded the Committee against its charter, breaking that charter into three areas: development of standard test methods (which received a "B"), development of standard guides and supporting data to use them (which received a "B+"), and the promulgation of these products (which received a solid "A"). While applauding G-4 success to date, Benz foresaw important work as just beginning.

G-4's most glaring shortcoming has been the lack of effort on "offgassing and reaction products and decomposition tendencies" which were a part of the original G-4 charter. To date, G-4 efforts have focused on ignition and combustion, and Benz's grade reduction indicates twenty years is enough to either address these areas or strike them from the charter.

G-4's most resounding success has been at the "promulgation and dissemination of knowledge" specifically through its course ***"Controlling Fire Hazards in Oxygen-Handling Systems"*** which to date has taught G-4 methods to more than 750 students.

Benz's prescience focused on three areas: (1) much more energy on the development of a fundamental science/theory foundation to help cope with potential legal consequences, (2) a mechanism [computer database] for managing the large amount of

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Progress at Denver: *.....Ordinary Plus a Symposium!*

The Committee concentrated on reconciling five balloted standards at the abbreviated Fall meetings. The sessions were trimmed to two days to accommodate the Seventh International G-4 Symposium.

The ***G-4 Main*** Committee began a review of "things that still need to be done." Included in the initiative will be gaps in experimental work for which - G-4 members might be able to contribute data or for which G-4 might be able to sponsor experimentation.

Among the topics that were cited for consideration were metals needing promoted combustion testing, polymers for which the oxygen community is in need of autogenous ignition temperature data, oxygen index data or heat of combustion data, validation of the CGA criteria for oxygen piping velocities, data for extrapolating the CGA curves to higher pressures, data needed to adopt pressure limits for stainless steels thicker than 0.125-inch, and others. This will be taken up in some detail at the Fall meeting.

The ***G4.01 Test Methods*** Subcommittee reconciled a first subcommittee ballot by Coleman Bryan for a method of measuring nonvolatile residue in water solvents by combustion. It passed without a negative and will proceed to main Committee ballot for the Fall meeting.

Recent round robin tests indicate a precision and bias statement will be possible in G 122 (on Cleaning Effectiveness).

The G 72 round robin testing is still advancing but is incomplete.

Standard D 2512 on LOX Mechanical Impact tests has been successfully balloted by F-7. It will now be submitted to a ballot within F-7 and G-4 regarding its transfer to G-4 and changes G-4 has suggested.

The ***G4.02 Practices*** subcommittee reconciled two Main Committee Ballots. Each should proceed to Society Ballot and publish later this Summer.

A ballot of the CFC Replacement Task Force's solvent selection guide was successful. This success was led by Ting Chou.

An ultrasonic cleaning method prepared by Coleman Bryan was also successful in Main Committee ballot. There were no negatives and so the standard will proceed to Society ballot and should publish this summer. A second similar ultrasonic method for extracting contaminants prior to cleanliness measurements drew a persuasive negative and will be reballoted.

Bill Royals' revision of the cleaning standard, G 93, drew a single negative ballot that was found to be persuasive. In addition, material in the ballot regarding necessary cleanliness levels will be removed for

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New G-4 Venture to Fill "Gaps"

G-4 began a "new" effort to fill in missing gaps in its body of work. To accomplish this several new task groups will begin to identify gaps in the standards, supporting data, and related tools that are needed to more nearly "complete" the technology available to address the oxygen compatibility subject.

Among the items that were cited for consideration were promoted combustion tests of those practical metals for which data do not currently exist, tests of polymers for which the oxygen community is still in need of autogenous ignition temperature data, oxygen index data or heat of combustion data, testing to validate the existing CGA criteria for oxygen piping velocities, collection of data and bases for extrapolating the CGA criteria to higher pressures, tactics for using metals at temperatures above the 200°F limit of CGA G-4.4, and the collection of data needed to support pressure limits for use of stainless steels thicker than 0.125-inch.

Another important new thrust, called for in the keynote address at the seventh G-4 symposium is a systematic effort to advance the scientific/theoretical understanding of materials flammability as it affects oxygen system design. This enormous challenge will demand experimental work and may require a piecemeal long-term approach.

Other efforts might include individual component testing, international reconciliation of documents, and the production of computer databases, computational programs, or expert systems.

The tentative approach will be to solicit ideas suggestions and provision of data from members firms and vendors. However, in those cases where energies available to G-4 are inadequate to accomplish what's needed, the new groups plan to prepare discrete programs with goals, justifications. and schedules, and to seek funding from producers and users to conduct any needed experimental, test, administrative or other work.

This approach is not new to G-4. In the early 1980's there were inadequate data to establish the metals standard, G 94, so G-4 solicited funding and conducted a highly successful test program at NASA's White Sands Test Facility.

In today's industrial climate of cost cutting and reengineering, a cooperative approach through G-4 may be a very effective way to achieve oxygen safety at reasonable cost. **G4N**

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data that has been identified and developed and an effort to fill gaps that are identified, and (3) effort to preserve and protect the long term health and vitality of G-4.

Benz's call for much more effort and progress on the extremely challenging theoretical foundations front may benefit from a recently formed Research subcommittee and a plan to promote and collect data necessary to fill in gaps in G-4's body of work.

To develop a database and fill gaps in the data, Benz suggested the G-4 solicit data or funds to direct data collection, as it has in the past. This approach may be even more effective today, because interindustry cooperation is growing and the era of reengineering may make pooling of test funds a good way to maintain data flow throughout the oxygen community.

Finally, Benz observes that there are few charter G-4 members remaining. Long term health demands that successors to the old leadership be deliberately groomed and mentored. Again, G-4 successes can result in a loss of commitment to the Committee's ongoing operations. As a committee of volunteers, G-4 needs a core of leadership with firm sponsorship. **G4N**

*(**Progress** continued from page 1)*

the time being. A reballot is targeted for the fall meeting.

The ***G4.05 Education*** subcommittee has been working to issue a computer disk of utilities since the Fall 94 meeting. Numerous delays pushed the mailing back to where it is likely to occur shortly after the Spring 1995 meeting. It will be mailed to all those in the G-4 database (that is, those who receive ***G-4 News***).

The TPT course is in the throes of heavy demand at present. Since the Fall meeting, five courses have been taught, including a session in concert with the Spring meeting. Three more are scheduled for later this Spring.

The advanced TPT course is progressing with the review of incidents that were submitted for use in the course. **G4N**

McIlroy Receives Award of Merit

Ken McIlroy of the Linde Division of Praxair, Inc., was awarded the ASTM Award of Merit at the Seventh International Symposium on Flammability and Sensitivity of Materials in Oxygen Enriched Atmospheres. The award was presented by George Moran, ASTM's Chairman. The G-4 nomination of Ken cited him "For outstanding leadership in the Committee G-4 on Compatibility and Sensitivity of Materials in Oxygen-Enriched Atmospheres CFC-Replacement Task Force through cleaning procedure and assessment development."

Ken has been active with G-4 since 1983, and those who follow G-4 are aware of Ken's many other contributions: Chair of the Practices Subcommittee since 1990 and presiding over the creation of seven standards and major revisions to two others, Vice-Chair of G-4 since 1990, Technical Editor and Chair for the award-winning Fifth International Symposium on Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres, as well as author or coauthor of twelve technical papers at G-4 symposia. This honor is well deserved and carries with it the appreciation of G-4 for a job well done.

Ken is just the fifth recipient to receive this honor in the twenty-year history of G-4. Previous recipients have been Coleman Bryan (1985), Barry Werley (1989), Robert Lowrie (1993) and Joel Stoltzfus (1993). **G4N**

Seventh G-4 Symposium Content

The Seventh International Symposium on Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres was held March 16-17 in Denver. The session was chaired by William Royals, Dwight Janoff, Mohan Gunaji, and Richard Paciej.

Four papers were withdrawn. However, eighteen papers listed in the program and two new papers were presented. Eighteen of these papers are expected to be in the symposium publication along with two new papers. The Special Technical Publication (STP 1267) is scheduled for publication this summer. The publication fee has not been set. Attendees and authors receive copies, other can contact ASTM Customer Service (215) 299-5585 to place orders.

The list of papers follows. Those that were presented verbally but will not be in the STP are indicated (*) as are those that were not presented but will only be in the STP (**).

"ASTM G-4 Twenty-Year Report Card: Keynote Address," Frank J. Benz, NASA JSC, Houston, TX.

"The Seal Configuration Tester, a New Approach to the Evaluation of Elastomeric Materials for Oxygen Service," Haynes Haselmaier, NASA Stennis Space Center, MS.

"A 500-Bar Gaseous Oxygen Impact Test Apparatus for Burn-Out Testing of Oxygen Equipment," Christian Binder, et. al., BAM, Berlin.

"Case Study of an Oxy-Acetylene Cutting Torch Failure and Measured overpressures Due to Flashback Reactions," Barry Newton, et. al., Wendell Hull and Associates, Las Cruces, NM..

"Design of the LOX and GOX Systems for the Stennis Space Center High Heat Flux Facility," Michael Yentzen, NASA, Stennis Space Center, MS.

"Reaction of Molten/Burning Aluminum with Liquid Oxygen," Hervé Barthélémy, et. al, Air Liquide, Paris.

"Promoted Ignition/Combustion Behavior of Selected Stainless Steels in Oxygen-Enriched Atmospheres," Robert Zawierucha, et. al., Praxair, Inc., Tonawanda NY.

"Promoted Ignition-Combustion Behavior of Aluminum in Oxygen Gas Mixtures," Ken McIlroy, et. al., Praxair, Inc., Tonawanda NY.

"Ignition and Combustion of Titanium Alloys," Mohan Gunaji, et. al., Lockheed ESC, Las Cruces NM.

"New Test Capabilities for the Evaluation of material Flammability in Oxygen-Enriched Atmospheres," Theodore Steinberg, et. al., University of Queensland, Brisbane, Queensland.

"Effect of Beryllium on the Burn Propensity of Titanium Alloys," R. Schmees, Pratt and Whitney, West Palm Beach FL.

"Promoted Combustion of Pure Metals in Oxygen-Enriched Atmospheres," S. Sircar, et. al., Lockheed ESC, Las Cruces NM.

"An Evaluation of Polymers as Ignition Sources During Particle Impact in Oxygen," J. Dees. et. al., Lockheed ESC, Las Cruces NM.

"Cone Calorimeter Testing of Epoxy/Fiberglass and Brominated Epoxy /Fiberglass Composites in Ambient and Oxygen-Enriched Atmospheres," F. Y. Hsieh, et. al., Lockheed ESC, Las Cruces NM.

"The Effects of Configuration, Forced Convection and Oxygen Concentration on the Flammability Behavior of Electronic Equipment," Dwight Janoff, et. al., NASA Johnson Space Center, Houston TX.

"Evaluation of the Compatibility of Materials Used in Breathing Devices," Amit Jain., et. al., Lockheed ESC, Las Cruces NM.

"A Protocol for Evaluating the Cleaning Efficiency, Corrosion Property and Oxygen Compatibility of Non-Ozone Depleting Cleaning Agents," Ting Chou, et. al., The BOC Group Inc., Murray Hill NJ.

**"Database of Polymeric Materials Behavior in Oxygen-Enriched Atmospheres,"* Barry Newton, et. al., Wendell Hull and Associates, Las Cruces NM.

"LASER-Assisted Cleaning for the Removal of Surface Contaminants," A. Englesberg, Radiant Services Co., Bethesda MD.

"Hybrid Chemistry as a Surface Preparation Alternative," E. Lethe, Inland Technologies, Inc., Tacoma WA.

***"Oxygen Administration: A Comparison of National Training Courses,"* L. Starr, OTI Research, Ardmore PA.

***"Flammability of Metals in Fluorine and Nitrogen Trifluoride,"* Carmen Gugliemini, et. al., Air Products and Chemicals, Inc., Allentown PA.

G4N

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Your name will be listed in our publicly available database of oxygen compatibility enthusiasts, please check ***all*** boxes that apply to you.

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- ☐ G-4 Symposium Attendee
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G-4 Events and Housekeeping

Regular meetings of the Committee G-4 have been scheduled as follows:
Nov 14-16, 1995 .....Norfolk, VA
Mar 19-21, 1996 .....Orlando FL
Nov 13-14, 1996 .....Seattle, WA
Mar 18-20, 1997.....St. Louis MO
Nov 11-12, 1997.....San Diego CA
Contact Steve Mawn (215) 299-5521 for details or membership data. ASTM Membership is $65 per year.

The next G-4 Symposia are on:
Nov 13-14, 1997.....San Diego, CA
For a Call for Papers or Program, call Steve Mawn (215) 299-5521.

Public offerings of the course: *Controlling Fire Hazards in Oxygen Handling Systems are* on:
Nov 13-14, 1995.....Norfolk, VA
Mar 18-19 1996.....Orlando, FL

Contact Scott Murphy (215) 299-5516 for information or brochure. Cost is $675.00 (including text). Can be offered at your site for a negotiated price.

The two-volume course text: *Fire Hazards in Oxygen Systems* may be ordered from Scott Murphy (215) 299-5516. Price is $195.

The G-4 Videotape *Oxygen Safety* PCN 12-700880-31 may be ordered from ASTM Customer Service at (215) 299-5585. Price $67.

Recent G-4 Standards actions/revisions:
G 124-94 "Promoted Combustion of Metals.."
G 125-94 "Flammability Limits of Materials (Oxygen Index)..."
G 128-95 "The Hazards and Risks of Oxygen.and Their Control...."

All G-4 standards appear in part 14.02 of the Book of Standards or may be ordered individually from ASTM Customer Service (215) 299-5585. Typical standard prices range $10-30.

Details:

This newsletter is a product of ASTM Committee G-4. The editorial staff is the G-4 Main- and Sub-Committee Officers and ASTM Staff:

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.03 Terminology	William Royals
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